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Introducing infants to referential events: A development study of maternal ostensive marking in French*

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ABSTRACT

It is well known that mothers give their infants lessons in conversational competence from an early age. This study considered how maternal gestures and prosody contribute to this developing competence. It examines how mothers use ostensive marking to point out common references at different stages of development. The corpus consisted of longitudinal observations of four mother-infant dyads during free play (infants aged a; 4 to i ; i), at three stages of sensorimotor development (III, IV and V). Four dimensions of ostensive marking were considered: (1) the span of the marked utterance (holistic vs. local); (2) the communication channel used (gestural vs. prosodic); (3) the type of gestural marker (oriented, iconic, conventional, beats); and (4) the type of prosodic marker (emphasis, prosodic cliché, reinforced nuclear stress, focal accent). Although there was no clear change in the patterns of specific types of gestural or prosodic markers, the results showed that mothers adapt their gestures to the infant's processing level. Between stages III and V, they move from holistic to local and from gestural to prosodic marking. Stage IV appears to be an excellent period for observing the transition.

INTRODUCTION

Many studies have described infant-directed speech and how it is organized syntactically (Newport, 1977) and prosodically (Garnica, 1977; Stern, Spieker & MacKain, 1982; Fernald & Simon, 1984; Bernstein Ratner, 1986; etc.). It has often been shown how this type of speech has a facilitatory effect for infants (e.g. Fernald & Kuhl, 1987), but to my knowledge, there are no systematic studies on the vocal and non-vocal devices used by mothers to lead their infants, via referent events, along the pathway to linguistic communication. Among the various processes involved in the development of communication and referential activity, shared attention plays a key role (Werner & Kaplan, 1963). In line with Adamson & Bakeman (1991:3), I shall consider this process in terms of people's activity and their needs and motives. Taking up on Gibson & Rader's (1979) ideas, I shall add that a motivated organism living and adapting to an environment is considered attentive as he or she searches for information that is necessary for performance (ibid: 7).

Adamson & Bakeman (1982) distinguished three phases in the acquisition of the capacity to share attention during infancy. Between the ages of 0 and 0; 6, during the affective reciprocity phase, the interaction - considered as a medium - and the topic of the communication are merged. Starting at the age of 0;3, when the first episodes of interpersonal engagement emerge, the mother¹ synchronizes her interactions with the infant's attention cycles. Faced with an infant who participates more or less actively in the interaction, the mother begins to ALTER her gestural-prosodic behaviours in accordance with the attention

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¹ A generic term that refers to the caregiver.

states of her infant. The mother's facial, gestural, and verbal productions are used as cues by the infant. Such productions simultaneously fulfill several functions: controlling affective states, capturing attention, patterning the infant's facial -gestural-vocal productions, structuring the interaction (Stern, Beebe, Jaffe & Benett, 1977), and supporting emerging functions. At the end of this phase, episodes of joint object involvement begin to multiply. It is the beginning of this type of exchange that Adamson and Bakeman call the 'nonverbal referencing phase' (0; 6 to 0; 8). During this phase, the communication medium and topic are gradually differentiated (Trevarthen & Hubley, 1978). Finally, after the appearance of the first lexical labels (Ninio & Bruner, 1978), infants move on to the 'linguistic referencing phase' (0; 9 to 1; 6), where, in collaboration with their mother, they deliberately engage in episodes of joint object involvement during which they attempt to share their knowledge and intentions. At this point, cooperation in joint intention begins (Trevarthen et al., *ibid*). It is not until the middle of the second year that infants become able to assume their part in the social coordination necessary for achieving the joint referencing that establishes the world-to-word correspondence system (Baldwin, 1991).

This slow progression towards referential activity would not be possible if the mother did not start managing the communication process right from the onset of the child's life. To prompt the infant to share events, the mother uses ostensive devices that are facial, and especially gestural and/or prosodic. These devices are attention markers likely to introduce the infant to habituation breaks (Papousek & Papousek, 1981). The purpose of such devices is (1) to make it plain to the infant that the mother has the same centre of interest, or that she intends to lead the infant to share an event she feels he/she is now able to grasp (see Sperber & Wilson, 1986); and (2) to make the 'conversation' progress by prompting attention behaviours in the infant that manifest his or her RECEPTION and ACCEPTANCE of the messages. These are the beginnings of the fundamental structuring of all linguistic communication. Via the gestural dimension, a mother frequently addresses her child using gestures to which the infant is already responsive at birth (Nelson & Horowitz, 1987). As she produces utterances she may employ nonsemiotic or non-discursive gestures (instrumental or expressive) as well as conventional, semiotic gestures (see Bates, Benigni, Bretherton, Camaioni & Volterra, 1979). Her utterances may also be supported by discursive gestures such as illustrators (which include iconic and deictic gestures) and beats (see Eckman & Friesen, 1969). At the auditory level, by the end of first few weeks of life, the infant has become affectively responsive to the mother's speech (Stern et al., 1982). He/she is especially responsive to the perceived loudness of pitch contours, which vary in intensity and frequency (Fernald, 1983). Moreover, the infant is innately biased to attend to stressed syllables that introduce a contrast in the verbal flow. Such exaggerated prosodic cues are not only useful to the partition of the speech stream, but also serve to mark phrase and clause boundaries (Morgan, 1986) and facilitate the extraction of word units (Gleitman & Wanner, 1982). Note that during the linguistic phase (1; 2), mothers use exaggerated *F₀* peaks on noun labels at the end of the utterance in order to promote the acquisition of a new word (Fernald & Mazzie, 1991).

The present study was aimed at showing how maternal ostensive gestural and/or prosodic marking is specifically adapted to the maturation of the infant's attentional capacities at three points in development, the beginning of the affective reciprocity phase (0; 4) and the beginning (0; 9) and middle (1; 1) of the referencing phase.

METHOD

Subjects

Four middle-class, primiparous mothers were asked to come to the laboratory once a month between the beginning of the fourth month and the beginning of the fourteenth month

after their infant's birth. This period of development starts at the moment when brief episodes of shared alertness are transformed into episodes of shared interpersonal engagement, and ends when the infant gains access to linguistic communication.

Procedure

The mothers were asked to play with their baby for three minutes. During the first few months of the study, the mothers sat on a mat with toys (a large yarn pom-pom, a puppet, a rattle, small foam balls, nested wooden figurines, a picture book, and various toy characters) facing the infant, who was in a reclining baby chair. Later, the infant was seated in a high chair at a table facing the mother sitting opposite her. Sessions were filmed from a fixed position using a video camera and a set of mirrors. The vocal productions were recorded on tape through a microphone located above the dyad.

Database

Given that the characteristics of mother-infant interactions as defined by Adamson & Bakeman are dependent upon the infant's developmental stage, two ordinal scales of psychological development (Uzgiris & Hunt, 1975) were applied after each session: scale II (means-end) and scale IV (causality). These scales were considered by Bates and her colleagues (1979) to be good predictors of language acquisition. The developmental periods under consideration were Piaget's (1936) sensorimotor intelligence stages III, IV, and V. Stage III is characterized by the appearance of secondary circular reactions, manifested, for example, by repeated arm movements to keep a toy in action (scale II) and by the use of causal action procedures in familiar play situations (scale IV). Stage IV is characterized by the co-ordination of secondary schemes. For example, the infant can let go of one or two objects to get a third one (scale II), touch the adult's hands in response to a causal action behaviour produced by an agent (scale IV). Finally, stage V is characterized by the appearance of tertiary circular reactions. For instance, the infant can refrain from pulling at an object above which another object is being held (scale II), push away or pull on the adult's hands to instigate or reject a behaviour (scale IV).

Among the 132 protocols gathered, 25 one-minute protocols produced by the four dyads were considered. The protocols selected were representative of stages III (mean age 0;7.8), IV (mean age 1;4), and V (mean age 1; 10.27) and only included the first minute of the recording². For three of the four dyads, four protocols representative of stages III and V and two protocols representative of stage IV were retained. For the fourth dyad, three protocols from each of the three developmental levels were selected.

Data reduction and coding

Video data. In interacting with their infants, the mothers produced utterances accompanied by gestures and facial expressions. The utterance, which was the basic analysis unit here, served to describe the behaviours manifested by the two partners. The various constituents of the utterance - syllable, word, syntactic group - were all potential auditory landmarks, and were used here to establish the timing between (1) the mother's non-verbal behaviours and (2) the infant's multimodal behaviours (vocalizations, gestures, and/or facial expressions). On this basis, the behaviour of each partner was described in three steps. First, the tape was played back and the movements and micromovements of the mother's head, hands, and trunk were listed and carefully labelled as to exactly when they occurred with respect to any

² The present study was part of a broader research project (Colas, 1993) in which the maternal behaviours studied here in a free play situation were compared to those produced under gestural-postural and facial-gestural-postural immobility.

accompanying utterances. On the second hearing of the tape, the infants' behaviours were described in synchrony with the maternal verbal and non-verbal behaviours. Finally, on the third hearing, the synchronization of the facial-gestural-vocal behaviours of the two partners was verified by re-checking their time of occurrence with respect to the various constituents of the corresponding maternal utterance.

Audio data. Only those utterances produced during shared attention episodes were retained in each protocol. In addition, in order to acoustically analyse only the useful part of the corpus, these utterances were assessed by the researcher via two perception tests. On the first test, the utterances were divided into two classes, those with a perceived pitch variation likely to be recognised in the end as an ostensive prosodic marker, and those without such a variation. To confirm the results of the first test, the second test was a 'blind' repetition of the first. Then to make sure that the utterances that had been perceived twice as having a pitch variation did in fact have one, the selected utterances were processed by an instantaneous, period-by-period pitch detector (developed by the 'Laboratoire Parole et Langage', ESA 6057, CNRS, Aix-en-Provence, France). On the basis of this analysis, the utterances retained for the study were those whose pitch contour exhibited an OBJECTIVE ostensive prosodic marker (characterized by a change in pitch and intensity, and an increase in duration).

In summary, the corpus selected for analysis included maternal utterances with or without ostensive markers (OM) produced during shared attention episodes in i one-minute protocols representative of stages III, IV, and V.

Categories of gestural and prosodic ostensive markers considered

A mother uses OM during speech to fulfill two communicative functions: (1) make her intent to communicate plain to the infant; and (2) manifest her intent to point out the referent event.

Gestural ostensive markers. Four OM categories were defined³: (I) Infantoriented gestures (0) (e.g. touching the infant while speaking) as in:

(1) 'Regarde-moi'
(Look at me).

(2) Conventional semiotic gestures (C) (see Bates et al., *ibid*), which included pointing and offering or requesting gestures, as in:

(2) 'Donne-moi la poupée'
(Give me the doll).

(3) Two types of discursive gestures: (a) iconic gestures (I), which by their form and execution mode, describe some aspect of the message being presented verbally (McNeill, 1986), as in:

(4) 'A Noel il y avait un sapin grand comme ça'
(On Christmas, there was a tree this big)

and (b) beats (B) or rhythmic movements or micro-movements of the head and/or arms, as in:

(4) Il est là le chapeau

³ In the examples that follow, the underlined portion indicates the place in the utterance where the gesture was produced.

(There it is, the hat).

Gestural OMs that occurred on a phrase (3) or at the initial or final boundary of the utterance (.) were labelled HOLISTIC. OMs produced on one of the syllables within the utterance (i and z) were called LOCAL.

Prosodic ostensive markers. Before presenting the types of prosodic OMs examined here, let us briefly summarize some of the features of prosody in French. Prosody refers to the formal (linguistic) structures of accentuation and intonation, which divide the parts of the utterance into syntactic and/or semantic units. The basic metric organisation of French is achieved by means of three types of accents, which are unmarked, non-emphatic prosodic forms. They are (5) the secondary accent in word-initial position (a), the primary accent in phrase-final position (b), and the nuclear stress, located on the last phrase in the intonative unit (c). These accents are word-level, phrase-level, and intonative unit-level (IU) accents, respectively.

(5) [(la maison) (de mon fils)]⁴ (the house of my son).

(a) (b) (a) (c)

Emphasis (or focalization) is added to this metric organisation. Focalization results from a variable degree of quantification (see Bolinger, 1961) with an ostensive value. It can be applied to each of the above types of accent. If the emphasis falls on the secondary accent (a) it is called insistence focalization, and if it occurs on the primary accent (b) or on the nuclear stress, it is called emphatic focalization (c) (see Di Cristo, in press).

Each prosodic category is defined by its intonative modality (assertion, question, implication, etc.) and its accent category. In the present study, the prosodic forms selected as likely to be recognized by the infant as a cue of the mother's intention to inform (OM) were extracted from the assertive JUs, whose basic contour in French consists of a rise followed by a fall. Moreover, these forms result from emphatic accentuation. Four types of prosodic OMs were taken into account. The first two, an emphatic form (6) and a prosodic cliché (7), were considered holistic because they occur at the intonative unit level. Both have a melodic quality, and in addition, prosodic clichés sound 'chanted'. Prosodic clichés are fixed patterns that convey a recognised meaning with a linguistic community. This device serves to inform the addressee of the characteristics of a state or an event (Fónagy, Bérard & Fdnagy 1983). The last two, focal accent (8) and reinforced nuclear stress (9), were considered local since they occur at the word level.

The first type of OM was an expressive emphatic focalization device, simply called 'emphasis' here. This sort of emphasis is realised on the intonative group by a very high Fo rise, a strong intensity change, and syllable lengthening, as in:

(6) 'Comme ça'
(Like this).

The second type of OM was a form of prosodic cliché which appears mainly in infant-directed speech during the prelinguistic and language acquisition periods. Prosodic clichés are fixed patterns that convey a recognized meaning within a linguistic community. These devices serve to inform the addressee of the characteristics of a state or an event. In infantrirected speech have a labelling function. They are realised as a smooth Fo curve that sounds melodic (Fónagy et al., *ibid*). The type of prosodic cliché studied here is a highly

⁴ Phrases are shown in parentheses, intonative units in brackets.

stylized prosodic form (Ladd, 1978), with sustained notes on each syllable, that is well processed by infants (Papousek & Papousek, *ibid*), as in:

(7) 'lapin'
(rabbit)

The third prosodic OM, focal accent fulfills an intensifying and contrastive function. This type of accent is realised on the first syllable of the word by a sharp F0 rise, an intensity change, and syllable lengthening, as in:

(8) 'C'est le lapin'
(It's the rabbit).

The fourth OM was reinforced nuclear stress. This type of accentuation is not necessarily a focalization accent. Its linguistic function is to mark the end of a word or group of words. However, in infant-directed speech, nuclear stress can have a focalization function when used to mark the end of an utterance in order to promote turn taking, or even to highlight a lexical item. It occurs on the last syllable in the intonative group and is realised by syllable lengthening and an F0 peak on the onset of the last syllable, as in:

(9) 'le lapin'
(the rabbit).

Hypotheses

Three hypotheses were set forth. They concerned (i) the span of the marked utterance, (2) the choice of a communication channel, and (3) the types of gestural and prosodic ostensive markers.

Hypothesis 1. Ostensive markers have a local or global impact on the utterance. One can assume that at around the age of 0; 4, during the affective reciprocity phase (stage III), the mother guides the infant's information processing using holistic OMs. Starting at 0; 9, at the beginning of the linguistic phase (stage IV) and all the more so at 1; 1 (stage V), the mother can be expected to primarily use local OMs to focus the infant's attention on the referent event.

Hypothesis 2. With development, there should be a progression in the communication channel chosen to highlight events. One can assume that mothers change from gestural-prosodic marking (GP) of events at stage III, to purely prosodic marking (P) at stage V.

Hypothesis 3. As the infant develops, one should observe changes in the types of marking devices used. Starting at stage IV, one can expect to find (i) an increase in conventional gestures and discursive beats at the gestural level, and (2) an increase in the use of focal accent at the prosodic level.

Factors

Two types of factors were studied, one independent variable and several dependent variables. The independent variable was the sensorimotor development stage defined by Piaget (stages III, IV and V).

Four dependent variables were considered, one for each maternal OM dimension analysed. The four dimensions were: (i) the span of the marked utterance, which included three spans, holistic (H), holistic/local (H/L), and local (L); (2) the communication channel

used for ostensive marking, which included the gestural (G), gestural-prosodic (G/P), and prosodic (P) channels; () the type of gestural marker, which included oriented gestures (O), conventional gestures (C), iconic gestures (I), and beats (B); and () the type of prosodic marker, which included emphasis (B), prosodic cliché (C), focal accent (F), and reinforced nuclear stress (R).

Analysis units and dependent variables

The analysis unit was the maternal utterance during shared attention episodes. The dependent variable was the number of instances of ostensive marking in each protocol, for each of the four analysis dimensions stated above.

For the sake of clarity, the results are presented in four sections, by dependent variable.

RESULTS

During the period studied, mothers were found to 'mark' a very large proportion of their utterances. There were more than twice as many marked utterances (70%) as unmarked ones. This is indicative of the mothers' strong desire to bring their infants into the world of communication.

Span of marked utterances

For all stages of development pooled, mothers exhibited a tendency to use more local ostensive markers (L: 46 %) than holistic ones (H: 34%), and few holistic/local ones (H/L: 20%). For the three stages of development, Table 1⁵ gives the number of OMs of each type used by the four mothers, and the per-mother mean and standard deviations for each marker.

To get a closer look at how ostensive marking was achieved, an ANOVA with the following design was computed: 3 spans (H, H/ L, L) x stages (III, IV, V). These two factors interacted ($F(4, 12) = 764$; $p < 0.031$, and span was marginally significant ($F(2, 6) = 5.047$; $p = 0.051$). More specifically, the simple effects indicate changes in the mothers' marking behaviour as their infants develop (Table 2). They showed that (1) the production of holistic markers (span factor) varied with age and was the highest at stage III and the lowest at stage V ($p < 0.002$); and (2) there was a significant difference between stages on the span factor (III: $p < 0.005$, IV: $p < 0.005$, and V: $p < 0.05$).

⁵ b, t, n, d : Bertille, Tatiana, Nina, Delphine.

TABLE 1. *Number of H, H/L, and L OMs produced by each mother (b, t, n, d⁵) during episodes of joint attention at each developmental stage, and mean (M) and standard variation (S.D.) in each case*

III										IV*										V									
Age (days)																													
	b		t		n	d	Total	M	S.D.	b		t		n	d	Total	M	S.D.	b		t		n	d	Total	M	S.D.		
	124	122	122	122	130	127	126	3.5		278	280	280	293	290		285	1.3		392	391	391	394	394		393	1.5			
H	11	9			3	5	28	7	3.65	7	6		4	3		20	5	1.83	5	1		2	1		2.25	1.89			
H/L	7	3			4	1	15	3.75	2.50	3	2.5		1	0.5		4	1.75	1.19	5	0		4	2		1.75	2.22			
L	7	4			3	2	16	4	2.16	5	6.5		10.5	11		28	8.25	2.96	7	4		12	4		6.75	3.77			

* At stage IV two protocols per dyad were considered. The number in each column (b, t, n, d) represents the mean number of occurrences in each OM category.

TABLE 2. *Simple effects of span on developmental stage, and of developmental stage on span factor*

	H	H/L	L
Stages III, IV, V	$Ms_n = 22.750$ $Ms_e = 2.639$ $F(2,6) = 8.621$ $p = 0.017$	$Ms_n = 4.000$ $Ms_e = 2.056$ $F(2,6) = 1.946$ $p = 0.239$	$Ms_n = 18.583$ $Ms_e = 10.139$ $F(2,6) = 5.833$ $p = 0.239$
	III	IV	V
	$Ms_n = 10.83$ $Ms_e = 2.417$ $F(2,6) = 5.414$ $p = 0.045$	$Ms_n = 42.250$ $Ms_e = 6.722$ $F(2,6) = 6.285$ $p = 0.034$	$Ms_n = 24.383$ $Ms_e = 3.889$ $F(2,6) = 6.257$ $p = 0.034$

A detailed analysis using Newman-Keuls pair-wise comparisons (all significant at $p < 0.05$) clearly indicated a difference in maternal marking behaviour between stages III, IV and V.

At stage III, the affective reciprocity phase, when the mother's goal is to establish and maintain mutual affect with her infant and the pleasure of interacting is a high priority, mothers use more marking over longer utterance spans (H: 41 %) than shorter ones (L: 20%). At stage IV, the beginning of the linguistic referencing phase, when communication routines are being acquired, the mothers used many local markers (L: 55%) but local marking did not differ significantly from holistic marking (H: 33 %). At stage V, in the middle of the linguistic referencing phase, the mothers employed far fewer holistic markers (H: 19 %) than they did at stage III (H: 23 %). For the first time, they preferred local markers (L: 8 %) for highlighting events.

Thus, at stage IV, the maternal behaviours observed clearly indicate a transition between stages III and V. At this stage, the production of holistic markers (H: 33 %) did not differ from local ones (L: 55 %), whereas at stage V, mothers tended to diminish holistic marking (H: 19 %). But the stage IV use of local markers did not differ significantly from local production at stage V. Holistic/local marking was scarce at stages IV and V (19 % and 23%, respectively), which did not differ significantly from each other. But these results do not tell us whether these markers have the same status in these two stages. Thus, the mothers' use of local markers (equivalent to stage V) and holistic markers (equivalent to stage III) shows that stage IV is indeed a period of transition.

Choice of a communication channel

To begin, note that for all stages of development pooled, maternal production of gestural OMs, whether or not accompanied by prosodic marking (G + G/P), was the most prevalent. Gestural marking represented more than 73 % of all OMs. The percentage of purely prosodic markers was relatively low (P: 27 %). Table 3 gives the breakdown of the types of OMs used by each of the four mothers during the period under study, and the per-mother mean and standard deviation for each marker.

TABLE 3. Number of G, G/P and P OMIs produced by each mother (b, t, n, d) during episodes of joint attention at each developmental stage, and mean (M) and standard variation (S.D.) in each case

Age (days)	III						IV*						V							
	b			t			b			t			b			t				
	s.d.			Total			s.d.			Total			s.d.			Total				
	124	122	130	127	Total	M	128	280	293	290	Total	M	392	391	394	394	Total	M	s.d.	
G	7	8	2	7	24	6	2.71	7	7.75	6.5	27.5	6.88	2	1	3	2	8	2	0.82	
G.P	13	5	4	1	23	5.75	5.12	5	5	6	3	19	4.75	8	0	9	2	19	4.75	4.43
P	5	3	4	0	12	3	2.16	3	2.5	3	5	13.5	3.38	7	4	6	3	20	5	1.83

* At stage IV two protocols per dyad were considered. The number in each column (b, t, n, d) represents the mean number of occurrences in each OM category.

An ANOVA with the following design was computed: 3 marker types (G, GP, P) x 3 stages (III, IV, V). These two factors were found to interact ($F(4, 12) = 4.13$; $p < 0.05$). Simple effects (Table 4) indicated an effect of developmental stage on the production of gestures (channel factor) ($p < 0.02$) which decreased on stage V. Simple effects also revealed significant differences among gestures on stage IV ($p < 0.02$).

TABLE 4. *Simple effects of marker type on developmental stage, and of developmental stage on marker type*

	G	G/L	L
Stages III, IV, V	$Ms_n = 14.333$ $Ms_e = 3.222$ $F(2,6) = 4.448$ $p = 0.065$	$Ms_n = 1.583$ $Ms_e = 6.694$ $F(2,6) = 0.237$ $p = 0.796$	$Ms_n = 3.250$ $Ms_e = 4.472$ $F(2,6) = 0.727$ $p = 0.522$
	III	IV	V
Marker types G, G/P, P	$Ms_n = 11.083$ $Ms_e = 9.417$ $F(2,6) = 1.177$ $P = 0.370$	$Ms_n = 5.250$ $Ms_e = 0.917$ $F(2,6) = 5.727$ $p = 0.041$	$Ms_n = 3.583$ $Ms_e = 8.694$ $F(2,6) = 0.412$ $p = 0.680$

The detailed analysis of the characteristics of maternal marking at each developmental stage using post hoc t-tests (significant at 0.05) indicated similarities in ostensive marking behaviour between stages III and IV, but significant differences from stage V.

At stages III and IV the mothers used more gestural markers (41 % and 46%, respectively) than prosodic ones (20 % and 22%, respectively). The switch from gestural to prosodic markers took place between stages IV and V, since the picture changed dramatically at stage V, with gestural marking dropping sharply (11%); mothers began to rely more heavily on prosodic devices (50%).

Forms of gestural and prosodic marking

Gestural marking. Remember that our hypothesis was that in order to prompt the infant to notice a referent event, mothers would use an increasing number of conventional gestures (C) and focal accents (F). They were also expected to use more beat gestures (B) as the infant approached the onset of the linguistic communication period.

For all stages of development taken together, iconic gestures (I: 41 %) outnumbered all others, with conventional gestures (C: 27%) in second place (indicating, offering, requesting). Mothers used few oriented gestures (O: 20%) and the even fewer discursive beats (B: 12 %). Table 5 gives the number of occurrences of each type of gesture produced by each of the four mothers during the period under study, and the per-mother mean and standard deviation for each marker.

Age (days)	III						IV*						V						
	b			t			b			t			b			t			
	d	n	Total	d	n	Total	d	n	Total	d	n	Total	d	n	Total	d	n	Total	
124	122	130	127	126	3.5		278	280	293	290		285	1.3		392	391	394	394	
O	4	8	0	12	3	3.83	0	3	0.5	0.5	4	1	1.41	0	1	0	3	4	1.41
C	2	1	1	7	1.75	0.96	1	5.5	6	3.5	16	4	2.27	2	0	1	2	5	0.96
I	9	0	1	16	4	4.24	10	3.5	4.5	1.5	19.5	4.88	3.64	6	0	1	0	7	2.87
B	0	0	0	0	0	0	0	1	1.5	3.5	9	1.5	1.47	0	0	6	0	6	3.46

TABLE 6. Number of E, C, R, and F OM's produced by each mother (b, t, n, d) during episodes of joint attention at each developmental stage, and mean (M) and standard variation (S.D.) in each case

Age (days)	III						IV*						V							
	b			t			b			t			b			t				
	d	n	s.d.	d	n	s.d.	d	n	s.d.	d	n	s.d.	d	n	s.d.	d	n	s.d.		
	124	122	130	127	126	3.5	278	280	293	290	Total	M	s.d.	392	391	394	394	Total	M	s.d.
E	4	2	0	1	7	1.75	4	0.5	0.5	3	8	2	1.78	3	0	2	3	8	2	1.41
C	5	0	5	0	10	2.5	5	3.5	1	0.5	10	2.5	2.12	3	0	3	0	6	1.5	1.73
R	4	1	0	0	5	1.25	4	0.5	0.5	2	7	1.75	1.66	2	0	0	0	2	0.5	1
F	6	5	0	0	11	2.75	6	3	6	3	18	4.5	1.73	7	2	10	2	21	5.25	3.95

* At stage IV two protocols per dyad were considered. The number in each column (b, t, n, d) represents the mean number of occurrences in each OM category.

An ANOVA with the following design was computed: 4 gestural marker types (0, C, I, B) x 3 stages (III, IV, V). There were no significant effects, although certain tendencies were observed.

Although the incidence of conventional (C) and iconic (I) gestural markers, highest at stage IV (40% and 43%, respectively) and lowest at stage V (23% and 32%, respectively), remained relatively stable, oriented gestures (O) were high for stage III (40%) and low for stages IV and V (18% and 18%, respectively), while beat gestures (B) were lacking at stage III and relatively high at stages IV and V (32% and 27%, respectively). This trend is in keeping with the prediction that at the later stages, mothers can structure their utterances from a more pragmatic-semantic standpoint. This type of marking may continue to increase with development.

Prosodic marking. Regarding prosodic marking, for all stages of development combined, the most prevalent type of OM was focal accent (8 %). Table 6 gives the breakdown of the types of prosodic OMs used by each of the four mothers during the period under study, and the per-mother mean and standard deviation for each marker.

An ANOVA with the following design was computed: 4 prosodic marker types (E, C, R, F) x 3 stages (III, IV, V). A significant effect of the type of prosodic marker was observed ($F(3,9) = 5.98; p = 0.02$).

A detailed analysis of prosodic marking using Newman-Keuls pair-wise comparisons (significant at 0.05) confirmed that for all stages pooled, focal accent was the mothers' preferred prosodic device.

DISCUSSION

The purpose of this study was to look into the vocal and non-vocal devices used by mothers as they manage collaborative interactions with their active, but still immature infant, in order to introduce him or her to the universe of communication.

As a whole, the results obtained are consistent with predictions. At stage III when the mother-infant relationship is mainly founded on the quest for mutual affect, which is needed to establish a common perspective, mothers point out events (the infant's states, situations, objects) by means of holistic marking. To draw their infants into cooperation and exchange, and thus to lead them to process the information being emphasized, mothers preferentially use the gestural channel to highlight events. They also tend to take advantage of all of the communication channels at their disposal by producing gestural-prosodic markers (see Legerstee, 1990). The holistic markers mothers employ tend to consist of oriented gestures and iconic gestures which permit them to 'act out' the event to be shared or noticed by the infant. The use of holistic markers could be a testimony to the fact that mothers provide all of the collaborative effort. As infants gradually become capable of noticing the referent event, and as they clearly manifest their intent to communicate (stage IV), mothers focus the infant's attention on the dialogue in order to involve him/her in the co-operative effort. To this end, they use an ever-growing number of local ostensive markers. This tends to be achieved at the gestural level by iconic and conventional gestures, and at the prosodic level, by focal accent. In addition to punctuating their own speech acts along with those of the infant, mothers' use of local ostensive markers has an additional purpose: to prepare the infant for attending to events of an increasingly restricted scope, a necessary condition for the emergence of lexical labelling at stage V. Surprisingly, however, beat gestures (B), which were expected to be more prevalent in infant-directed speech at the end of the prelinguistic period, appear to be rare. Totally lacking at stage III, they were infrequent at stages IV and V. One can assume that at the close of the prelinguistic period, the main concern of mothers would be to highlight referents with devices the infant him/herself knows how to use (i.e. conventional gestures) rather than paying attention to the pragmatic-semantic structure of her utterances.

The results obtained here show above all that mothers make every effort to finely tune their behaviour to the communicative capacities of their infants. In this respect, their ostensive marking practices at stage IV are quite exemplary. Faced with an infant fully involved in the acquisition of the rules of prelinguistic communication, mothers manage not to forget that the infant's participation in the dialogue is still fragile. This is why they periodically rely on the marking techniques used at stage III to reestablish mutual effect, the sole guarantee of the cohesion of the two partners in the interaction. At this point in development, the infant is still unable to participate in an efficient manner, for he/she has not yet completely acquired communication routines and still cannot cooperate. Thus, mothers shift from the behaviour that prevailed at stage III (holistic marking) to the behaviour they will use at stage V (local

marking). While still marking to-be-shared events by gestures as in stage III, at stage IV, mothers tend to use a rich gamut of gestural devices. Accordingly, maternal ostensive marking behaviour is clearly different from that exhibited at the preceding stage. Mothers tend to rely again on iconic gestures to point out the features of the referent at times when mutual affect needs to be reinforced, but for the first time they SEEM to employ conventional gestures to emphasize the communicative acts of the infant, or even to point to the object to which they are referring. In other words, here again, the transitional nature of stage IV can be seen. As for prosodic marking, it seems that mothers use focal accent, a device that will be further developed at stage V. This kind of highlighting of events from the very beginning of communication could reflect mothers' will be prepare their infants for linguistic communication. However, although not analysed here, one can assume that at stage IV, focal accent serves more to highlight acts of communication than to label objects as referents, as it will in stage V.

Thus, the complexity of the ostensive marking of events by mothers at stage IV is a clear example of the depth of maternal intersubjectivity. The means utilized by mothers indicate their ability to make events that the infant is experiencing 'sharable' and above all, to help their infants enter into the communication process by borrowing the devices infants use themselves to process events. This is the price mothers pay to make mutually manifest their intent to inform. Via this approach, through which the mother lowers herself to the infant's level, mothers provide all of the collaborative effort necessary for durable communication (Clark & Wilkes-Gibbs, 1986) and minimize that effort in their young addressee. Ostensive marking of an event declared as the current referent facilitates the acceptance by the infant of the mother's contribution. In addition, mothers transform the reactions and initiatives of the infant into contributions, as they assign the role of conversational partner to the infant (Bruner, 1975; Trevarthen, rcyp). In the end, this is what makes the infant into a 'converser' capable of providing his/her share of the cooperative effort.

The results presented here show that ostensive marking by mothers fulfills a specific function in the acquisition of linguistic communication, where referring to events and objects plays a crucial role. They are encouraging, but can only be regarded as a beginning. To further validate these findings, additional studies are needed in several areas. One way to gain insight into how this complex system of ostensive marking operates during the preparation and installation of linguistic communication would be to include the infants' responses in the analyses. Moreover, a longitudinal, sequential analysis of the exchanges would provide a more detailed picture of the way in which mothers control the collaborative process at each stage of development. Here again, the transitional stages (like stage IV here) appear to provide an invaluable period for observation. This type of analysis should also consider the developmental pattern specific to each individual dyad, in an attempt to improve our understanding of just exactly why and how the changes occur.

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